CLAIMS

1. A remotely interrogable SAW (surface acoustic wave) temperature sensor comprising, on the surface of a quartz substrate cut along the direction Y' making an angle θ with the direction Y:

- at least two resonators ($T_{1,SAW}$, $T_{2,SAW}$) comprising transducers consisting of interdigitated electrodes connected to control buses of design such that they have different characteristic operating frequencies; and

- a first resonator having a first surface acoustic wave propagation direction, parallel to one of the axes of the substrate, and a second resonator having a surface acoustic wave propagation direction making a nonzero angle (β) with the propagation direction of the first resonator,

characterized in that the control buses (B_{21}, B_{22}) of the second transducer are inclined at a nonzero angle (γ) to the normal to the interdigitated electrodes of said second transducer so as to compensate for the power flow divergence of the acoustic waves relative to the direction of propagation of the surface acoustic waves along said second transducer and characterized in that the substrate is a quartz crystal cut along the crystallographic axes (X,Y',Z), the Y' axis making an angle θ with the Y axis, and in that the angle of the buses to the wave propagation direction within the second resonator satisfies the following formula to within ± 0.5 degrees:

$$\gamma(\beta,\theta) \approx A1(\theta)\beta + A2(\theta)\beta^3 + A3(\theta)\beta^5$$
$$A1(\theta) = 0.6259 - 0.014\theta + 1.9152\times10^{-4}\theta^2$$
$$A2(\theta) = -5.1796\times10^{-4} + 1.2673\times10^{-5}\theta - 1.397\times10^{-7}\theta^2$$
$$A3(\theta) = 4.3\times10^{-8} - 4.8611\times10^{-9}\theta + 4.5141\times10^{-11}\theta^2.$$

2. The sensor as claimed in claim 1, characterized in that, since the operating frequency band of said sensor is bounded between a lower frequency (F_l) and an upper frequency (F_u), the characteristic operating frequencies of each of said resonators lie within said band

and their difference is maximized in order to increase the sensitivity of said sensor.

3. The sensor as claimed in either of claims 1 and 2, characterized in that, when the angle θ is between 30° and 40° and the angle ß is between 14° and 22°, the angle γ is between 5° and 6°.

4. The sensor as claimed in one of claims 1 to 3, characterized in that it includes at least one resonator comprising a transducer with an aperture corresponding to the extent of overlap between interdigitated electrodes, having a weighting function along the acoustic wave propagation axis in order to couple as little as possible the transverse propagation modes and therefore to reduce their influence.

5. The sensor as claimed in claim 4, characterized in that the weighting function is an arccosine function.

6. The sensor as claimed in one of the preceding claims, characterized in that, since each resonator comprises a transducer inserted between two reflector arrays, the periods of the arrays are such that their reflection coefficient is centered on the central frequency of said transducer.

7. The sensor as claimed in one of the preceding claims, characterized in that the second resonator has nonsymmetrical distances between reflector arrays and transducer.

8. The sensor as claimed in claim 7, characterized in that the distances between the two reflector arrays and the transducer are equal to $0.45\lambda + \frac{\lambda}{2} \cdot \frac{\varphi}{360}$ and $0.45\lambda - \frac{\lambda}{2} \cdot \frac{\varphi}{360}$, respectively, where λ is the characteristic wavelength of the transducer and φ is the

directivity phase between the reflection coefficient and the transduction coefficient.

9. The sensor as claimed in one of the preceding claims, characterized in that the resonators have an impedance close or equal to 50 ohms.

10. A temperature/pressure sensor, characterized in that it comprises a temperature sensor as claimed in one of the preceding claims and, on the substrate of said temperature sensor, a third resonator (P_{SAW}) and means for applying pressure to said third resonator, said resonator having a surface acoustic wave propagation direction parallel to the surface acoustic wave propagation direction of the first resonator.

11. The sensor as claimed in one of the preceding claims, characterized in that the resonators are connected to an antenna and are in parallel.

12. The sensor as claimed in claim 10, characterized in that:

- the periods of the first, second and third reflector arrays are equal to 3.62 μm, 3.69 μm and 3.62 μm, respectively, and the periods of the first, second and third transducers are equal to 3.60, 3.67 and 3.60 μm, respectively;
- the distances between reflector arrays and transducers are equal to 3.28 μm and 3.28 μm in the first resonator, 3.82 μm and 2.85 μm in the second resonator, and 3.27 μm and 3.27 μm in the third resonator, respectively;
- the aperture of the transducers within the three resonators is equal to 350 μm;
- the number of electrodes within the reflector arrays is equal to 270, 360 and 270, respectively; and
- the number of electrodes within the transducers is equal to 136, 164 and 136, respectively.

13. A pressure/temperature measurement device comprising a sensor as claimed in one of the preceding claims and a remote interrogation system.